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TREE-HEIGHT CHART FOR TOPOGRAPHIC LEVEL

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For a long time the Abney level and the engineers chain have been used by foresters for both land surveying and measuring the height of trees. When slopes are steep, trees tall, and crowns dense, the task of making the required corrections for horizontal distance in calculating tree height becomes quite laborious. This is especially true when the base and top of the tree being measured are not visible at full chain intervals, thus forcing the observer to compute horizontal distance for irregular slope distance.

In 1927 McArdle and Chapman[1/] prepared a chart giving graphical solution of tree-height measurements for use with the percent scale of the Abney and slope distances measured in feet. This chart, however, cannot be used with the topographic scale and distance measured in chains.

The attached chart has been designed to provide a graphic solution of tree-height measurements when using the topographic Abney scale and slope distance measured in chains and links.

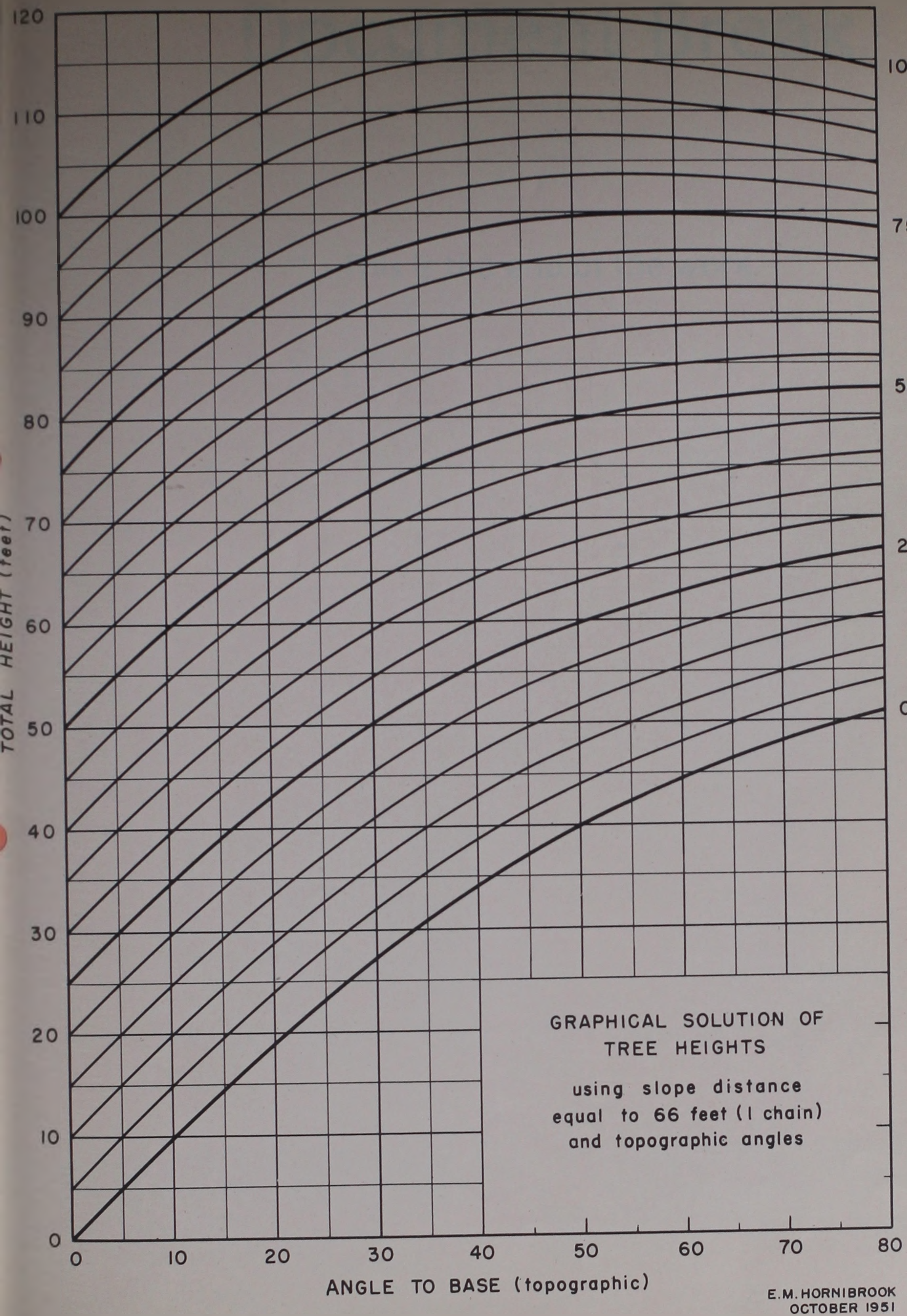
1/ R. E. McArdle and R. A. Chapman. 1927. Measuring tree heights on slopes. Journal of Forestry 25:843-847.

How to use the chart.-- Select a point from which both the base and top of tree are visible. Measure the distance from tree base to observer's eye in chains and links. The observer's eye must always be level with or above the level of the tree base. The chart cannot be used if the angle to the base of the tree is positive. Measure the angle from observer's eye to tree base and to top, using the topographic scale. Enter the chart with these angles. The total height of the tree (read at the left of chart) is represented by the point where the vertical line representing the angle to the base (found at bottom of chart) intersects the curved line representing the angle to the top (read at right of chart). If the slope distance is one chain the height is read directly from the chart. If more or less than one chain, multiply the chart reading by the number of chains or decimal fractions thereof. Interpolations between the lines for angles not shown are easily made.

Example:

Angle to base is -30, angle to top is +70, slope distance is 1 chain. Total height is 91 feet.

If the slope distance was 1/2 chain (50 links) the height would be 0.5 x 91 = 45.5 ft. If the slope distance was 2 chains the height would be 2 x 91 = 182 ft. Likewise if the slope distance was 2 chains 77 links the height would be 2.77 x 91 = 252 ft.


120
110
100
90
80
70
60
50
40
30
20
10
0
TOTAL HEIGHT (feet)
100
75
50
25
0
ANGLE TO TIP (topographic)
0
10
20
30
40
50
60
70
80
ANGLE TO BASE (topographic)
GRAPHICAL SOLUTION OF
TREE HEIGHTS
using slope distance
equal to 66 feet (1 chain)
and topographic angles
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